Small Molecule –
Technical Insights Series

Outsourcing Raw Material Testing. Essential aspects to consider when selecting a service provider.

A fundamental role in drug product manufacturing and release

Rigorous raw materials testing (often called excipient testing when applied to non-API components) is essential to ensure that materials meet predefined quality and safety criteria, to prevent contamination, and to maintain compliance with regulatory and pharmacopeial standards.

In pharmaceutical manufacturing, raw materials—including active pharmaceutical ingredients (APIs) and excipients—form the foundation of every drug product irrespective of dosage form or product type. While APIs often garner most of the attention, excipients (the "inactive" ingredients) can constitute as much as 90 % of a dosage form, making their quality, purity, and consistency critical to safety and performance.

John Welch, Associate Director – Business Operations at Butterworth Laboratories provides an insight into the considerations and benefits of outsourcing raw material testing. For any drug product programme irrespective of modality, raw material testing is a regulatory expectation, this article is a useful guide when considering the selection of suitable service providers to support material testing.

John has worked for Butterworth for 38 years. Starting as a Laboratory analyst in 1987, then QA Manager from 1993 before moving to Business Development in 2000 and taking up his present position in 2018.

Considerations: Raw Materials Testing

There are many considerations necessary when determining specifications for raw materials. Excipients vary widely (e.g., fillers, binders, disintegrants, lubricants, coatings), therefore each requires tailored analytical strategies. A one-size-fits-all approach is rarely sufficient. The following points help to distil the testing approach:

1. Excipient Functionality

What are the key physical and chemical characteristics of the excipients and how can a specific grade be distinguished from a series.

2. Low-Level Impurity Detection

Some harmful impurities (e.g. elemental impurities, genotoxic impurities, solvent residues) may be present only at trace levels, demanding highly sensitive methods and careful calibration.

3. Method Validation & Robustness

Analytical methods must be validated (accuracy, precision, specificity, LOD/LOQ, linearity, etc.) under pharmacopeial or regulatory guidance. They must remain robust under sample variability.

3. Supply Chain Variability and Vendor Risk

Raw material suppliers may differ in their quality standards or practices. Batch variability, cross-contamination, or sourcing from recycled or adulterated materials require the manufacturer to independently verify incoming materials.

Practical techniques

A spectrum of analytical methods can be employed to support raw materials / excipient testing against the specifications required.

- **Chromatographic techniques (HPLC, UPLC, GC):** Useful for detecting organic impurities, residual solvents, degradation products.
- **Ion chromatography:** For ionic or ionic impurity profiling.
- **Inductively Coupled Plasma (ICP-MS / ICP-OES):** For elemental impurity detection, trace metals, heavy metals.
- **Fourier Transform Infrared (FTIR) Spectroscopy:** To identify molecular functional groups, confirm identity, detect contaminants.
- **UV-Visible / Fluorescence Spectroscopy:** To detect chromophoric impurities or degradation.
- **Physicochemical testing (moisture content, particle size, density, pH, etc.):** To ensure excipient functionality meets specification.
- **Residual solvent / volatile impurity analysis:** Because many manufacturing processes employ organic solvents, leftover traces must be quantified and controlled.

These techniques, when combined, provide a multi-dimensional profile of the material—identity, purity, stability, and impurity burden.

Although not provided by Butterworth Laboratories, Microbiological analysis is also an important aspect in terms of Quality Control of Raw Materials.

A service provider can be seen as an extension to a clients own laboratory resources

Timeframes for testing

At Butterworth Laboratories, testing requirements are categorised as either **Quality Control** or **Projects**, depending on the nature of the services requested.

Quality Control testing includes standard identification (ID) tests and compendial analyses that can be executed using validated in-house methods or pharmacopeial monographs. These typically form part of established raw material testing programmes and are scheduled within standard laboratory turnaround times.

Projects testing applies where a specific analytical method must be developed or verified for a non-compendial material or an in-house specification. Such projects often require method development, validation, and technical documentation before routine testing can commence.

Typical timeframes are:

- **Quality Control testing:** Our standard timeframe for this type of testing is 10 working days. However, this can be expedited, dependent upon the timeframes requested.
- **Projects testing**: Depending upon the type of work requested, a Project Manager is appointed to ensure plans are agreed with the client in advance of any work being undertaken and ongoing updates on progress of the work are provided. Turnaround time are longer, generally 6–10 weeks

Developing **long-term partnerships,** enables forecast planning and volume scheduling to support resource allocation, resulting in maintenance and continuity of testing, and delivery of consistent on-time, in-full (OTIF) performance. Regular communication between client and laboratory teams supports capacity management, trend review, and continuous improvement across ongoing commercial testing programmes.

Data Quality and Reporting

The provision and access to data in a timely manner is essential for clients to plan and schedule their own business operations. Service providers can assist their clients using Paperless Reporting processes, allowing documents to be provided and accessed via secure file sharer services.

If during either Quality Control or Projects type analysis, something unusual is noted or the results are not as expected, open communication is key to resolving problems and driving investigations to closure in a timely manner. When unexpected findings occur—such as out-of-specification or unexpected results—analytical teams can quickly identify potential root causes, recommend confirmatory testing, and propose corrective actions, minimising delays in product release or development timelines.

Benefits of Service Providers: Expertise, Problem Solving, and Timely Resolution

Partnering with an experienced raw material testing service provider offers significant advantages beyond routine analysis. Expert analytical teams bring deep knowledge of pharmacopeial methods, regulatory expectations and enable rapid turnaround times when required.

For Projects analysis involving Method Validation, clients can be assured that methods developed and validated will be QC Laboratory ready for transfer back to the clients' facilities. Alternatively, a service provider can be seen as extension to a clients own laboratory resources, to provide additional analysts and instrumentation, working alongside the clients own laboratory teams to shorten practical timescales and add additional robustness testing to method validations.